cular tissue more than any other parasite with which we are acquainted, although differing from it in habitat, in having little caudal appendage, and in being without, as far as we could discover, any distinct cyst, excepting that of the ovum before alluded to. This is the first instance within our knowledge of Entozoa having been found in the lungs. The *Filaria bronchialis* inhabits the bronchial glands, and is moreover about an inch in length.

We had an opportunity likewise of examining the ova of these animals, and of observing them in several stages of development. Some contained a simple oval granular mass (fig. 4); in others this appeared to be contracting (fig. 5), and in various stages of division and subdivision. In some there was a separation into two parts (figs. 6 & 7); others presented a mulberry mass similar to that found in the ova of other animals (figs. 8 & 9). Different degrees of progressive formation were observed from this subdivision up to the completion of the perfect animal coiled up within its unruptured envelope (fig. 10).

XII.—*The Musci and Hepaticæ of the Pyrenees.*

By Richard Spruce.

[Concluded from vol. iii. p. 503.]

Subtribus 2. Jungermannideæ, N. ab E.

5. *Plagiochila,* Nees et Mont.

8. *P. asplenioides,* L.; Hook. Br. Jung. t. 13 (sub *Jung.*); Syn. Hep. p. 49.

Hab. Z_{0-3} in umbrosis per montes totos. In Pyrenæis tres præprimis formas innotavi: sunt—

1. *minor*; H. P. 6: caule gracili, squamis minutissimis (ne amphigastriis dicam) in ventre adsperso vel nudo; foliis subsecundis, margine dorsali valde reflexis et ex eo ad *P. porelloidem* appropinquans.—*Hab.* in sylvis Pyren. centralium.

2. *major*; H. P. 7: foliis maximis, confertis, patulis; squamis caulinis obviis, plerumque amorphis, nonnullis bifidis, nonnullis lineari-digitatis.—*Hab.* in valle *du Lys.*

3. *heterophylla,* N. ab E.? Syn. Hep. p. 50; H. P. 8: caule flagellifero, squamis minutis subulatis prædito; foliis repandis, retusis emarginatisve.—*Hab. Val de Jéret* et *Bois de Gouerdère,* in rupibus umbrosissimis.

9. *P. Pyrenaica,* Spruce in Hep. Pyren. n. 9: *caule horizontali in planum ramoso*; foliis imbricatis, plano-distichis aut adscendentibus, subconvexis, ovato-subquadratis, *apice variis,* ob-

lique unidentatis, truncato-bidentatis, denticulatis, retusis vel obtusis omninoque integerrimis: involucralibus majoribus, subverticalibus, arcte adpressis, ovato-linguæformibus, repandis subdenticulatisve; *perianthio obovato-oblongo,* compresso, incurvo, *ore spinuloso-dentato* hinc plerumque fisso.

Hab. Z_{1-2} ad rupes humidiusculas Pyren. centralium (*Superbagnères*; *Grottes de Bédat* prope *B.-de-Bigorre*; *V. de Gazos*) et occidentalium (*Mont Goursi*; *Gave de Valentin*).

Caules intertexti, fertiles $\frac{1}{2}''$–$1''$, steriles $2''$–$3''$ longi. *Folia* ramorum fertilium plerumque integra retusave, sterilium contra vario modo incisa rarius integra et integerrima. Retis areolæ 6-angulares, subcontiguæ. Color viridi-olivaceus sicco statu in lutescentem vergens. *Perianthium* superne ampliatum. Capsulas maturas non habui.

Florescentia monoica: perigonia spiciformia: folia lobulo involuto spinuloso vel laciniato-dentato stamina obtegente prædita.

Plagiochila interrupta, N. ab E. Syn. Hep. p. 48, planta plerumque humilior, *folia semper integerrima* et *perianthium ore repando-crenulatum* habet. *P. porelloides* N. ab E., *caulibus adscendentibus* et *foliis gibbis, flaccidis, integerrimis,* sat superque distincta.

Although I have lately had Dr. Gottsche's sanction for retaining *Plagiochila Pyrenaica,* I think it not improbable that it may one day be proved a variety of *P. interrupta,* a striking one certainly, and perhaps confined to the Pyrenees. The *Plagiochilæ* are so liable to variation in the toothing of the leaves, that it is scarcely possible to suppose all the generally received species genuine. I have seen no specimens of *P. porelloides* which I can safely separate from *P. asplenioides.*

6. *Scapania,* Lindenberg.

10. *S. compacta,* Roth, Fl. Germ. 3. p. 375 (sub *Jung.*); Syn. Hep. p. 63. *Jung. resupinata,* Hook. Br. Jung. t. 23.

"Var. 1, foliis in duplicatura sæpius alatis, ala repando-dentata, lobo ventrali *convexo*;" H. P. 10.—*Hab.* Z_0 in Agro Syrtico circa *St. Sever* et Aquas Tarbellicas. "*Collines de St. Pandelon, de Tercis*;" Grateloup in 'Cryptogamie Tarbellienne.'

"Var. 2, foliis ut plurimum inæqualiter bilobis, lobo ventrali *concavo*;" H. P. 11.—*Hab.* Z_1 P. c. in arenosis supra pagum *Gerde* prope *B.-de-Bigorre.*

Possibly a distinct species from the foregoing. The segments of the leaves are *subtrapezoidal, quite entire,* the *sinus gibbous,* the areolation rather closer and subguttulate. I have, however, only the sterile plant.

11. *S. undulata,* L. Sp. Pl. p. 1598 (sub *Jung.*); Hook. Br. Jung. t. 22; Syn. Hep. p. 65; H. P. 12.

Hab. Z_{0-3} in umbrosis humidis ad saxa. *Pont d'Espagne. Mt. Crabioules. V. de Courbettes* (Philippe!). "In Agro Syrtico prope *Dax*" (Grateloup, *l. c.*).

12. *S. nemorosa,* L. Sp. Pl. p. 1598 (sub *Jung.*); Hook. Br. Jung. t. 21. f. 1–4; Syn. Hep. p. 68; H. P. 13.

Hab. Z_{0-3} locis sylvaticis, frequens.

13. *S. umbrosa,* Schrad. Samml. 2. p. 5; Hook. Br. Jung. t. 24; Syn. Hep. p. 69; H. P. 14.

Hab. Z_{2-3} P. occ. ad saxa prope pontem dict. *Pont d'Espagne.* P. c. in monte *Crabioules* ad ligna putrida. E rarioribus.

14. *S. apiculata,* Spruce in Hep. Pyren. n. 15; caule brevi simplice, infra perianthium innovante, e basi flexuosa repente adscendente; foliis pallidis vel fuscescentibus, infimis minimis, bidentatis, vix complicatis, superioribus majoribus, *usque ad* $\frac{1}{3}$ *bifidis,* conduplicatis, *lobis oblique rhomboideis, apiculatis, subrepandis, haud arcte adpressis,* ventrali plerumque concavo, dorsali paulo minori, convexo, margine tamen sæpius reflexo, sinu depresso, *guttulato-areolatis,* cellulis discretis; involucralibus conformibus, deflexis; perianthio oblongo-clavato, compresso, subdeflexo, ore repando.

Hab. Z_2 supra ligna putrida in sylvis editioribus. P. occ. *Vallée de Béost.* P. c. *Cascade du Cœur* prope *B.-de-Luchon.*

S. umbrosa, proxima, *colore specioso albo roseove,* caule subramoso, *foliis homomallis, argute serratis, usque ad* $\frac{2}{3}$ *bifidis,* lobo dorsali ventrali 3–4plo minori, diversa est. *S. curta* N. ab E. *foliorum forma, perianthio ciliato,* &c. distinctissima.

7. *Jungermannia,* Linnæus.

Obs. Of the *Jungermanniæ* observed in the Pyrenees, *Jg. acuta* and *Wilsoniana* have their normal station on calcareous rock; *Jg. exsecta, ventricosa, curvula, incisa, divaricata, reclusa, curvifolia* and *setacea* were gathered *only on decayed wood*; the remainder are chiefly glareal or viatical, and some of them were also occasionally seen on decayed wood. It will be remarked that those species which in the Pyrenees occupy semiputrid trunks are the same which inhabit heaths on the plains and hills of the north of Europe. The species which approaches nearest the snow-line is *Jg. julacea.*

§ 1. Complicatæ, Syn. Hep.

15. *J. albicans,* Linn. Sp. Pl. p. 1599; Syn. Hep. p. 75.

Hab. Z_{0-4} terrestris et rupestris, fere ubique.

16. *J. obtusifolia,* Hook. Br. Jung. t. 26; Syn. Hep. p. 76; H. P. 16.

Hab. Z_{0-2} in viarum cavarum parietibus solo arenoso. P. occ. *St. Sever; Cauterets.* P. c. *B.-de-Bigorre; Port de Portillon.*

17. *J. exsecta,* Schmid. Ic. p. 241. t. 62; Hook. Br. Jung. t. 19; Syn. Hep. p. 77; H. P. 17.

Hab. Z_2 in truncis putrescentibus. Fructiferum legi in monte *Pic de Ger,* P. occ.

The fructification in my specimens differs somewhat from the description in 'Synopsis Hepaticarum'; it is as follows:—Involucral leaves with very acute segments, otherwise not differing from the cauline ones, with the exception of the innermost, which is rather shorter and terminated by several unequal apiculate teeth: it is accompanied by a lanceolate very acute stipule. Perianth oblongo-cylindrical, compressed, with four obtuse angles or plicæ, the mouth ciliate.

§ 2. Integrifoliæ, Syn. Hep.

18. *J. Schraderi,* Mart. Fl. Erlang. Cr. p. 180. t. 6. f. 55; Syn. Hep. p. 83; Sullivant! Musci Allegh. n. 235; H. P. 18.
Hab. Z_2 P. c. ad saxa in umbrosissimis secus cataractam *Cascade du Cœur* dictam.

19. *J. hyalina,* Lyell in Hook. Br. Jung. t. 63; Syn. Hep. p. 92; H. P. 21.
Hab. Z_{1-2} P. c. in rupibus secus rivulos, rarius ad terram. *Vallée de Castelloubon*; *Gorge de Labassère,* &c.

20. *J. nana,* N. ab E.; Syn. Hep.! p. 91; H. P. 20.
Hab. Z_{1-3} per Pyrenæos occ. et centr. in viis cavis, sed nusquam copiosa. *Col de Louvie*; *Bois de Lagaillaste*; *Esquierry,* &c.

21. *J. Genthiana,* Hueben. Hep. Germ. p. 107; Syn. Hep. p. 94. "*J. crenulata,* Sm., var. foliis caulium fertilium *minus compresso-contiguis, vix marginatis, perianthio* (*haud compresso*) *obovato,* submucronato, *plicato-4-angulo, angulis papilloso-alatis;*" H. P. 19.
Hab. Z_{1-2} P. c. ad viarum parietes. *Bois de Gerde* prope *Bagnères,* pulcherrime! *Port de Portillon,* &c.

The characters quoted above from 'Hepaticæ Pyrenaicæ' correctly indicate the differences of this plant from *Jg. crenulata,* and I am now quite satisfied of their being specific.

22. *J. crenulata,* Sm.! E. Bot. t. 1463; Syn. Hep. p. 90.
Hab. Z_{0-1} in arenosis turfosisque Agri Syrtici et P. centr., rarior. *St. Sever*; *B.-de-Bigorre.*

23. *J. sphærocarpa,* Hook. Br. Jung. t. 74; Syn. Hep. p. 93; H. P. 22.
Hab. Z_{1-2} P. occ. et c. locis similibus ac *Jg. hyalina* (n. 19). *Gorge de Cauterets*; *Labassère*; *Forêt de Transoubât* (Philippe!).

The black crumbling schist at *Labassère,* on which *Jg. sphærocarpa* and *hyalina* occur intermixed, is precisely of the same nature as the alum-shale in Eskdale near Whitby, Yorkshire, and it is remarkable that there also the same two species grow together in considerable quantity.

24. *J. cordifolia,* Hook. Br. Jung. t. 32; Syn. Hep. p. 95; H. P. 24.

Hab. Z_{1-3} P. c. in fontibus profundis secus ripas flum. *Adour,* in pagi *Asté* conspectu; necnon in humidis montis *Crabioules.*

Dr. Gottsche informs me that this species does not differ from *Jg. tersa* γ. *rivularis* of German authors.

25. *J. riparia,* Tayl.! in Annals of Nat. Hist. xii. p. 88; Syn. Hep. p. 97; H. P. 25.

Hab. Z_{1-3} in rupibus irroratis, rarius ad terram, frequens.

This species is often mixed with *Jg. acuta,* but it is not, like that species, confined to calcareous rock.

26. *J. pumila,* With. Arrang. 3. p. 866; Hook. Br. Jung. t. 17.

Hab. Z_2 P. c. ad saxa in sylva *Bois de Sajust* dicta: aliubi haud visa.

I cannot distinguish authentic specimens of *Jg. Zeyheri,* Hueben, from this. Both are remarkable for the perianth terminating in a cone, which is not plicate, but has *a furrow on each face,* that on the dorsal being most evident, and along this the dehiscence takes place for the emission of the capsule.

§ 3. Bidentes, Syn. Hep.

27. *J. acuta,* Lindbg.; Syn. Hep.! p. 103. *J. Muelleri,* N. ab E.; Syn. Hep.! p. 99; H. P. 26, 27, 28*.

Hab. Z_{1-2} locis calcareis subhumidis terrestris et saxatilis, rarius lignicola, per Pyrenæos frequentissima.

In 'Hepaticæ Pyrenaicæ' I gave three forms of this species, scarcely differing from each other except in *size*; the third form (No. 28) attains a length of 3 or 4 inches, and forms closely-tufted patches on the nearly vertical faces of rocks watered by the spray of rivulets in the upper part of the *Vallée d'Ossau* and the *Gorge de Labassère.* I there considered *Jg. Bantriensis,* Hook. Mst., which I gathered abundantly in Teesdale in 1843, as belonging to the same species, but at Dr. Gottsche's suggestion I have reconsidered this opinion, and I now think that the two may in all cases be safely distinguished. The differences are these:—in *Jg. Bantriensis* the leaves are always more or less erect, and in the large form they are *secund,* the two rows being contiguous by their upper surfaces, which I have never seen to be the case in *Jg. acuta*; they are also less undulate, *the sinus not gibbous,* though from the incurvation of the apices there is sometimes the appearance of it. Perianth when *young* (and in all stages when *unfertile*) *pyriform or broadly clavate*; while *the perianth of Jg. acuta,* in all states and at every age, even when quite

* *Jg. acuta* and *Muelleri* are now ascertained to be absolutely identical, the former having the stipules nearly or altogether obsolete.

short and half-developed, is of equal width from a little above the base to the summit, i. e. *cylindrical**.

28. *J. Lyoni,* Tayl. ! Trans. Bot. Soc. p. 116. t. 7; H. P. 29.

Hab. $Z_{1\ sup.—2}$ inter muscos ad saxa sylvarum, haud rara. *Val de Jéret,* &c.

The authors of 'Synopsis Hepaticarum' had surely never seen correct examples of this when they referred it to *Jg. socia,* N. ab E., and their description of it, "foliis laciniis obtusis," is quite at variance with specimens I possess from Messrs. Lyon and Taylor. It is singular that its near ally, *Jg. barbata,* Schreb., one of the commonest species in our mountains, should never have been observed in the Pyrenees. Dr. Grateloup indeed mentions it in his list as growing at the extreme western angle, "in montibus petrosis *Cambo* prope Bayonam," but without seeing his plant I dare not say that it is different from *Jg. Lyoni*†.

29. *J. Wilsoniana,* N. ab E.; Syn. Hep. p. 103; H. P. 30. *J. turbinata,* Wils. ! in E. Bot. Suppl. t. 2744. *J. inflata,* E. Bot. t. 2512.

Hab. Z_1 in rupibus calcareis subhumidis. *Gélos* prope *Pau. B.-de-Bigorre.*

30. *J. ventricosa,* "Dicks."; Hook. Br. Jung. t. 28; Syn. Hep. p. 108. *J. porphyroleuca,* N. ab E.; Syn. Hep. p. 109. "*J. alpestris,* Schleich.;" H. P. 31.

Hab. $Z_{2—3}$ ad terram et truncos putridos. P. c. *Ruisseau d'Ardalos.* P. occ. *Val de Jéret.*

I am doubtful whether Dickson meant this species by his *Jg. ventricosa,* Fasc. 2. p. 14. He gives no figure, but cites figures of Micheli and Dillenius, which are certainly little like our plant, and adds, "*Folia in nostra profundius fissa,* quam in figuris Michelii et Dillenii depinguntur," which is still more at variance with the species as figured by Hooker. Dr. Gottsche informs me that when this plant grows on rotten wood, where it often assumes a purplish tinge (as in some of my Pyrenean specimens), it is the *Jg. porphyroleuca* of Nees. In 'Hepaticæ Pyrenaicæ' I had considered this form as possibly *Jg.*

* The plant alluded to at the close of my description of *Jg. Bantriensis* ('Annals,' 1844) as gathered by Mr. Ralfs at Dolgelley, is possibly distinct from both the above. The three perianths in my possession are all subtriangular on the section, the dorsal face being the narrowest, and in one perianth the two lateral angles are winged and toothed. If it must be referred to one of the two, it will be to *Jg. acuta,* as it has the gibbous sinus of the leaves characteristic of that species. Mr. Wilson, to whom I am indebted for the specimens, has called it *Jg. culearis.*

† Dr. Grateloup mentions in his list "*Jg. setiformis,* Ehrh. Hab. in sylvis ad terram et ad arb. truncos. *Dax. Lésperon. Saubagnac*;" but as I searched for it in these stations without success, I cannot include it in my enumeration. It would be indeed remarkable to find in the *plains* of the south of Europe a species which grows most profusely in Lapland (Wahlenberg), and which when it extends farther south is uniformly *alpine.*

alpestris, Schleich., but specimens of the latter from Dr. Gottsche differ in having the leaves *roundish-ovate* (not quadrate as in *Jg. ventricosa*), the *sinus small*, and the *segments unequal, oblique*.

Var. *minor*. "*Jg. excisa*, Dicks. ? var. foliis e basi cuneata ovato-quadratis obovatisve, marginibus inflexis, sinu triangulari lunatove, involucralibus bifidis, integerrimis; perianthio oblongo, ore obtuse plicato;" H. P. 32.

I believe I am correct in regarding this a minute form of *Jg. ventricosa*; the leaves are usually more deeply cloven, the sinus triangular, the segments often divaricating; and yet stems of the large, ordinary form may be found having the same characters.

31. *J. curvula*, N. ab E.; Syn. Hep. p. 115; H. P. 33.
Hab. Z_2 P. occ. in valle *Combascou* supra ligna putrida.

32. *J. capitata*, Hook. Br. Jung. t. 80; H. P. 34. *J. excisa* β. *crispata*, Hook. *l. c.* t. 9. ff. 2, 11, 12. *J. intermedia*, Lindbg. Hep. Europ. p. 83; Syn. Hep. ! p. 116.
Hab. Z_{0-2} P. occ. in arenosis *Sti. Sever.* P. c. in truncis putridis secus cataractam *Cascade du Cœur* dictam: rarior.

I am quite of opinion that the original name of Hooker should be retained for this species. Lindenberg was evidently not aware that his own *Jg. intermedia* and Hooker's *Jg. capitata* were forms of one species; from his description it is probable that he did not clearly distinguish it from some forms of his *Jg. bicrenata*, as he cites for it Hooker's tab. Suppl. 2 (Synopsis, p. 11), which exactly resembles Ekart's figures of *Jg. bicrenata*, and agrees well with specimens of the gemmiferous state of that species in my possession.

33. *J. bicrenata*, Lindbg. Hep. Eur. p. 82; Syn. Hep. ! p. 115; H. P. 35, 36.
Hab. Z_{0-1} in arenosis ad viarum parietes. *St. Sever. Pau. Bagnères.*

Dr. Gottsche has pointed out to me *the remarkable scent of this species*, resembling that of *Jg. acuta* and *Bantriensis*, and *quite wanting in Jg. capitata*; by this character, by the deeply and acutely cloven leaves, and especially by the *guttulate areolation*, *Jg. bicrenata* may always be safely distinguished.

I fear *Jg. excisa*, Dicks. Crypt. 3. p. 11. t. 8. f. 7, will have to be entirely erased from the list of Hepaticæ. I have spent much time in the attempt to ascertain what it really is, but without success; formerly I thought it might be *Jg. bicrenata*, especially as there is a rude attempt in Dickson's figure to represent the guttulate areolation, characteristic of that species; but the larger size, the *branched stem*, and especially the *narrow shallow sinus of the leaves*, seem to disprove such a supposition. Very lately I consulted the Smithian herbarium in the hope of finding an original specimen from Dickson, but even the name does not seem to exist there. I have examined a multitude of specimens from various parts of the British Isles, sent

under the name of "*Jg. excisa*:" these belong in nearly equal quantities to three species, viz.:

1. *J. ventricosa*, forma minor = *J. excisa*, Hook. t. 9 (excl. var. β).
2. *J. bicrenata*, Lindbg. = *J. excisa* gemmifera, Hook. t. Suppl. 2.
3. *J. capitata*, Hook. = *J. excisa* β. *crispata*, Hook. t. 9. ff. 2, 11, 12 = *J. intermedia*, Lindbg.

It is exactly the same with specimens of "*Jg. excisa*" from the continent of Europe, nor have I ever seen a specimen agreeing with the descriptions that have been given of this species. Hooker says of *Jg. excisa*, "foliis *profunde* emarginatis;" of *Jg. ventricosa*, "foliis *obtuse* emarginatis:" Lindenberg says of *Jg. excisa*, "Differt . . . . . foliis *minus profunde* incisis:" lastly, the authors of 'Synopsis Hepaticarum' describe *Jg. excisa*, "foliis . . . *sinu profundo obtuso* excisis." From these and similar discrepancies, I cannot help concluding that these distinguished hepaticologists had under their eyes small forms of *more than one* of the three species above-cited when they drew up their descriptions of the supposed "*Jg. excisa*, Dicks." Dr. Gottsche has even admitted to me that he is unable to determine *Jg. excisa* if given to him without a name. He adds, "what I have received from my English and German friends under the name of *Jg. excisa* differ so much from each other, that I confess not to know the species."

34. *J. incisa*, Schrad.; Hook. Br. Jung. t. 10; Syn. Hep. p. 118; H. P. 37.

Hab. Z_{0-2} in truncis prostratis cariosis Pyrenæorum, frequens. "Ad terram humidam ac in rupibus muscosis circa Aquas Tarbellicas" (Grateloup, *l. c.*).

The leaves of this species are normally *conduplicate*; the lowest unequally bidentate with diverging segments, as in many *Scapaniæ*; the upper with very unequal lobes, *the dorsal lobe triangular, undivided, appressed to the stem, the ventral lobe bifid*: both either entire at the margins or with a few spinulose teeth. This is the typical structure, but, very rarely, the dorsal lobe is also bifid, and sometimes the ventral lobe is not bifid, but cut at the margin into several unequal spinulose teeth: sometimes it is trifid. In all cases the complication is discernible, notwithstanding the thickness of the stem, and even when the lobes are squarrosely spreading (as is seen also in some true *Scapaniæ*, e. g. in varieties of *S. nemorosa*). Hooker's figs. 3 and 4, tab. 10, show this quite distinctly.

35. *J. minuta*, Crantz; Hook. Br. Jung. t. 44; Syn. Hep. p. 120; H. P. 38.

Hab. Z_2 P. occ. ad rupes, haud vulgata, locis *Val de Jéret* et *Montagne Verte*.

§ 4. Bicuspides, Syn. Hep. (= Trigonanthus, nob. in hb.).

Obs. This very natural group, resembling *Lophocolea* in the nature of its fructification, may well constitute a separate genus, for which

I propose the name *Trigonanthus*. Many of the species are stellatedly branched, and, in all, the branches seem to have the same origin (*e dorso*). In those species which have *the stems exstipulaceous*, there are always *involucral stipules* present, e. g. in *Jg. bicuspidata*, where the *lowest stipule* is lanceolate, the *second* obcordate, the *third* obcordate with a deeper notch, the *fourth* (next the perianth) irregularly trifid, and the perianth itself is composed of a *fifth* stipule connate with two opposite leaves: hence *its trigonous form* and obvious affinity to that of *Lophocolea*. The capsule is always *oblong*, and often remarkably so.

36. *J. divaricata*, Smith! in E. Bot. t. 719. *J. Starkii*, Hb. Funck; Syn. Hep. p. 134; H. P. 39.

Hab. Z_2 P. c. supra ligna putrida in sylva *Forêt de Transoubât* dicta, non procul a *B.-de-Bigorre*.

I have examined the original specimen of *Jg. divaricata*, figured in 'English Botany,' from "Heaths near Holt, Nov. 1798, Rev. Mr. Francis": it possesses very distinct *stipules* (!), and agrees in other respects with what has been called *Jg. Starkii* by German authors, and by Dr. Taylor *Jg. stellulifera*. My own herbarium contains a great many forms, some stipulaceous throughout the length of the stems, others only towards the apex, and some altogether without stipules. Between all these I can draw no certain line of demarcation, and if there be more than one species there must be several. In every form the leaves are nearly of the same width as the stem, roundish in outline or a little quadrate, the segments mostly acute and either diverging or connivent (when the leaves appear subcomplicate), the cellules mostly 4-sided with rounded angles and discrete by narrow interstices. In all there is the same peculiarity of the involucral leaves being united so as to form one or two exterior perianths; all have these leaves toothed and the real perianth more or less ciliated at the mouth.

37. *J. Francisci*, Hook. Br. Jung. t. 49; Syn. Hep. p. 133; H. P. 40.

Hab. Z_0 P. occ. ad fossarum parietes in ericetis Agri Syrtici, loco *Landes de Mugriet*.

38. *J. dentata*, Raddi in Mem. della Soc. Ital. di Mod. xix. p. 32; Syn. Hep. p. 143.

Hab. Z_0 P. occ. *St. Sever*, in arenosis, sociis *J. bicrenata* et *Trichostomo subulato*.

This differs somewhat from the description in 'Synopsis Hepaticarum.' The stems are closely creeping, mostly simple, rarely with one branch. Leaves brownish, crowded and capitate on the flowering shoots, scarcely at all complicate, cloven mostly to below the middle, spinuloso-dentate, the cellules rather small but discrete (not with such wide interstices as in *Jg. Turneri*). Stipules, on the lower part of the stem, minute, irregular in form, usually lanceolate or subulate and toothed; towards the apex larger, those of the involucre

oval (= ½ leaf) and as well as the involucral leaves deeply toothed or even laciniate.

The stems of *Jg. Turneri*, Hook., are much longer, more slender, and branched as in *Jg. bicuspidata*; the leaves are smaller and *more complicate*, and there are *no stipules*.

39. *J. reclusa*, Tayl.! in Annals of Nat. Hist. xii. p. 89; H. P. 41.

Hab. Z_2 in truncis putridis. P. occ. *Pic de Ger.* P. c. *V. de Castelloubon.*

I consider this quite distinct from *Jg. bicuspidata* (with which Dr. Gottsche unites it as var. *ericetorum*), and in some respects more nearly allied to *Jg. connivens*. In 1846 Mr. Jenner showed me magnificent patches of it, growing with *Jg. connivens*, &c., on sand-rocks in Eridge Park, Tunbridge Wells.

40. *J. bicuspidata*, L.; Hook. Br. Jung. t. 11; Syn. Hep. p. 138; H. P. 42.

Hab. Z_{0-4} ubique.

41. *J. connivens*, Dicks. Cr. fasc. 4. p. 19; Syn. Hep. p. 141.

Hab. Z_2 P. c. loco *Hourquette d'Aspin*, lignicola. Semel visa!

42. *J. curvifolia*, Dicks.; Hook. Br. Jung. t. 16; Syn. Hep. p. 142; H. P. 43.

Hab. Z_2 in truncis putridis, frequens.

§ 5. Æquifoliæ, N. ab E.

43. *J. setacea*, Web.; Hook. Br. Jung. t. 8; Syn. Hep. p. 144; H. P. 44.

Hab. Z_{2-3} supra ligna putrida, rarior. *Val de Jéret. Mt. Crabioules.*

44. *J. trichophylla*, L.; Hook. Br. Jung. t. 7; Syn. Hep. p. 145; H. P. 45.

Hab. Z_{2-4} ad saxa, truncos putridos, inter muscos, &c., vulgata.

45. *J. julacea*, Lightf.; Hook. Br. Jung. t. 2; Syn. Hep. p. 146; H. P. 46.

Hab. Z_{1-5} in rupibus humidis. P. c. *Mt. Crabioules*; *Lac Lehou.* P. or. "in convalle *Eynes*" (Montagne, *l. c.*).

8. *Sphagnoecetis*, N. ab E.

46. *S. communis*, N. ab E.; Syn. Hep. p. 148; H. P. 47. *Jung. Sphagni*, Dicks.; Hook. Br. Jung. t. 33.

Hab. $Z_{0-1\ inf.}$ ad arborum excisarum truncos cariosos in imis Pyrenæis. "*Dax*, in paludibus spongiosis turfosisque inter *Sphagnum palustre*" (Grateloup, *l. c.*).

9. *Liochlæna*, N. ab E.

47. *L. lanceolata*, L. (sub *Jung.*); Hook. Br. Jung. t. 18; Syn. Hep. p. 150; H. P. 48.

Hab. Z_{0-2} secus rivulos Pyrenæorum, lignicola, rarius terrestris rupestrisve, frequens; necnon in Agro Syrtico loco *St. Pandelon de Dax.* "In collibus umbrosis et ad rupes cretaceas *Tercis*; necnon rupibus ophiticis *St. Pandelon* prope *Dax*" (Grateloup, *l. c.*).

10. *Lophocolea*, N. ab E.

Obs. The species of this genus may all be considered rare in the Pyrenees. *L. bidentata* I did not once observe in the higher mountains, though it occurred at the foot of the low hills near *Pau*, intermixed with mosses; yet I can hardly persuade myself that it does not ascend higher, and that, being reputed so common a plant, I may have passed it by unnoticed. *L. heterophylla*, another species equally frequent with us, I gathered but once in the Pyrenees.

48. *L. minor*, N. ab E.; Syn. Hep. p. 160; H. P. 49.

Hab. Z_1 P. c. in aggeribus circa *B.-de-Bigorre* (♂) et in valle *d'Aure* dicta.

49. *L. bidentata*, L. Sp. Pl. p. 1598 (sub *Jung.*); Hook. Br. Jung. t. 30.

Hab. $Z_{0-1\ inf.}$ P. occ. et c. circa *Pau* et *Dax*. In montibus nusquam vidi!

50. *L. heterophylla*, Schrad. (sub *Jung.*); Hook. Br. Jung. t. 31; Syn. Hep. p. 164; H. P. 50.

Hab. Z_2 P. c. *Cascade du Cœur* supra ligna putrida: e rarioribus.

11. *Harpanthus*, N. ab E. (caractere extenso).

51. *H. scutatus*, Web. et Mohr, Taschenb. p. 408 (sub *Jung.*). *J. stipulacea*, Hook. Br. Jung. t. 41.

Hab. Z_2 P. c. in monte *Crabioules* ad truncos putridos, sociis *Scapania apiculata, Jg. Schraderi*, &c.

The fructification of this plant is *truly lateral* (ramulo fertili e ventre caulis exeunte), and not as described in 'Synopsis Hepaticarum,' p. 101, "perianthio terminali, mox dorsali," for an instance of which I have in vain searched perhaps a hundred fertile stems. *The involucral leaves are normally two, with an interposed stipule*, and the uppermost leaf is concrete with the perianth for one-third of its length. *The perianth is very thick below* (= 3–4 cellules), and should perhaps be rather regarded in this part as *a hollowing out of the apex of the stem. The calyptra is concrete with the inner surface of the perianth for more than half its length*, as correctly represented in Hooker's figure, but not alluded to in 'Synopsis Hepaticarum.' All these characters bring this species very close to *Harpanthus Flotovianus*, N. ab E. (Syn. Hep. p. 170), the sole tangible difference being that in the former the perianth is obovate and in the latter fusiform, while they separate it widely from *Jung. acuta* and *Bantriensis*. If we consult now the organs of vegetation, we find the similarity quite as striking. The leaves of *H. Flotovianus* are *biden-*

tate in the same manner, only with a shallower sinus; the stipules are proportionally narrower, but *equally acuminate*, falcate and slightly *twisted*, and *toothed on each side at the base* just as in the other. With so many points of agreement, and with the same general habit (*H. scutatus* being only a smaller plant), I do not hesitate to place these two species in the same genus, which will still remain equally well distinguished from *Jungermannia* on the one side and from *Chiloscyphus* and *Lophocolea* on the other.

12. *Chiloscyphus*, N. ab E.

52. *Ch. pallescens*, Schrad. Cr. Gew. 2. p. 7 (sub *Jung.*); Syn. Hep. p. 187.

Hab. Z_1 P. c. ad terram in monte *Lhieris*.

53. *Ch. polyanthos*, L. Sp. Pl. p. 1597 (sub *Jung.*); Syn. Hep. p. 188.

Hab. Z_3 P. c. ad rivuli ripas in monte *Crabioules*.

Var. *β. rivularis*, Lindenb. Hep. Eur. p. 30; H. P. 51.—*Hab.* Z_1 in fontibus profundis secus ripas flum. *Adour*, socio *Jg. cordifolia* (n. 24).

Subtribus 3. Geocalyceæ, N. ab E.

13. *Saccogyna*, Dumortier.

54. *S. viticulosa*, L. Sp. Pl. p. 1597 (sub *Jung.*); Hook. Br. Jung. t. 60; Syn. Hep. p. 194; H. P. 52.

Hab. Z_0 P. occ. in rupibus ophiticis *Sti. Pandelon* prope Aquas Tarbellicas. "Les rochers crayeux de *Tercis*, de *Rivière*; les forêts de *St. Vincent*, de *St. Paul*, de *Narrosse*; les côteaux de *St. Pandelon*" (Grateloup, *l. c.*).

Subtribus 4. Trichomanoideæ, N. ab E.

14. *Calypogeia*, Raddi.

55. *C. Trichomanis*, L. Sp. Pl. p. 1579 (sub *Mnio*). *Jung. Trichomanis*, Dicks.; Hook. Br. Jung. t. 79. *Calypogeia Trichomanis*, Corda; Syn. Hep. p. 198; H. P. 53.

Hab. Z_{0-2} ubique: fructifera in sylvis prope *Jurançon*.

15. *Lepidozia*, N. ab E.

56. *L. reptans*, L. Sp. Pl. p. 1599 (sub *Jung.*); Syn. Hep. p. 205; H. P. 54. *Jg. reptans*, Hook. Br. Jung. t. 65.

Hab. Z_{0-2} supra ligna putrida, vulgaris.

16. *Mastigobryum*, N. ab E.

57. *M. deflexum*, N. ab E.; Syn. Hep. p. 231; H. P. 55.

Hab. Z_{2-3} in sylvis editioribus, haud rarum. *Mte. Verte*; *V. de Castelloubon*; &c. *Lac Lehou* (Philippe!).

58. *M. trilobatum*, L. Sp. Pl. p. 1599 (sub *Jung.*); Syn. Hep. p. 230; H. P. 56. *Jg. trilobata*, Hook. Br. Jung. t. 76.

Hab. Z_{0-1} P. occ. in arborum excisarum truncis cariosis *Sti. Pandelon* prope Aquas Tarbellicas; locis similibus *Sti. Sever* invenit cl. Dufour! P. c. *Gorge de Labassère* (Philippe!).

Subtribus 5. Ptilidieæ, N. ab E.

17. *Trichocolea*, Dumortier.

59. *T. Tomentella*, Ehrh. (sub *Jung.*); Syn. Hep. p. 237; H. P. 57. *Jg. Tomentella*, Hook. Br. Jung. t. 36.

Hab. Z_{0-2} locis humidis, frequens. "In umbrosis humidiusculis, in collibus et ad arb. truncos prope *Dax*" (Grateloup, *l. c.*).

Subtribus 6. Platyphyllæ, N. ab E.

18. *Radula*, N. ab E.

60. *R. complanata*, L.; Hook. Br. Jung. t. 81 (sub *Jung.*); Syn. Hep. p. 257; H. P. 58.

Hab. Z_{0-2} ad truncos et rupes.

19. *Madotheca*, Dumortier.

61. *M. lævigata*, Schrad.; Hook. Br. Jung. t. 35 (sub *Jung.*); Syn. Hep. p. 276; H. P. 59.

Hab. Z_{0-2} in rupibus: semper sterilem inveni.

62. *M. platyphylla*, L.; Hook. Br. Jung. t. 40 (sub *Jung.*); Syn. Hep. p. 278; H. P. 60. *M. platyphylloidea*, N. ab E.; Syn. Hep. p. 280. *M. navicularis*, N. ab E.? Syn. Hep. p. 277?

Hab. Z_{0-2} in rupibus arboribusque, vulgatissima.

Subtribus 7. Jubuleæ, N. ab E.

20. *Lejeunia*, N. ab E.

Obs. The only species of this genus which attains the alpine region is *L. serpyllifolia*, but it is always unfertile there. *L. ovata* finds in the Pyrenees its only continental station, and but the second known, the first being the south-west corner of Ireland, around Bantry and Killarney. *L. calcarea* is confined to the rock indicated by its name*.

* I did not observe *Lejeunia minutissima* in the Pyrenees, but it will not be out of place to mention here that I had lately the opportunity of examining Sir J. E. Smith's original specimens of this species, gathered in the New Forest by C. Lyell, Esq. in 1806, and figured on plate 1633 of Eng. Bot., and that they agree *as to the presence of stipules and every other essential character* with Hooker's figure in 'Brit. Jungermanniæ,' t. 52. Dr. Taylor was therefore in error (as I have always suspected) in maintaining Sir J. E. Smith's plant to be the *exstipulaceous* species; but as my distinguished and lamented friend was the first clearly to distinguish the latter, I propose that it shall bear his name, and the amended synonymy will stand thus:

Lejeunia minutissima, Smith! in Eng. Bot. t. 1633 (sub *Jung.*); Hook. Br. Jung. t. 52. *Jungermannia ulicina*, Tayl.! in Trans. of Edinb. Bot. Soc. 1841, i. p. 115. *Lejeunia ulicina*, Syn. Hep. p. 387.

Lejeunia Taylori, Spruce. *Jungermannia minutissima*, Tayl.! *l. c.* (non Smith). *Lejeunia minutissima*, Syn. Hep. *l. c.*

63. *L. serpyllifolia,* Dicks. Crypt. fasc. 4. p. 19 (sub *Jung.*); Syn. Hep. p. 374; H. P. 61.

Hab. Z_{0-3} in rupibus, arboribus imis, supra muscos, &c., frequens.

64. *L. ovata,* Tayl.! mst.; Syn. Hep. p. 376; H. P. 62.

Hab. Z_1 P. occ. inter muscos in rupibus subhumidis faucis *Gorge de Cauterets* dict. repens.

I have sedulously compared this with specimens of *L. ovata* gathered in company with Dr. Taylor at Cromaglown, one of his original stations, and cannot detect the slightest difference. It is a rather larger plant than *L. hamatifolia,* Hook., from which it differs essentially as follows: the leaves are *more lurid and opaque* (more chlorophyllose) and *never serrated,* as they are most frequently in the other; the larger lobe is *oblique, trapezoideo-ovate,* with the *margins convex* nearly to the apex (while in the ovato-acuminate leaves of *L. hamatifolia* the margins of the larger lobe are *concave* above the junction with the involute lobe); the involute lobe is smaller, and has not a projecting tooth near the apex as in *L. hamatifolia.*

65. *L. calcarea,* Libert; Syn. Hep. p. 344; H. P. 63. *Jg. hamatifolia β. echinata,* Hook. Br. Jung. t. Suppl. 3.

Hab. Z_2 P. occ. ad saxa calcarea in regione media montis *Pic de Ger,* ut et in valle *Combascou.*

21. *Frullania,* Raddi.

66. *F. dilatata,* L. Sp. Pl. p. 1600 (sub *Jung.*); Syn. Hep. p. 415; Hook. Br. Jung. t. 5; M. P. 64.

Hab. Z_{0-3} in arborum cortice.

67. *F. fragilifolia,* Tayl.! in Annals of Nat. Hist. xii. p. 172; Syn. Hep. p. 437; H. P. 65.

Hab. Z_1 P. occ. in arboris unicæ trunco prope pagum *Gélos.*

68. *F. Tamarisci,* L.; Hook. Br. Jung. t. 6 (sub *Jung.*); Syn. Hep. p. 438; H. P. 66.

Hab. Z_{0-3} fere ubique, arborea et saxatilis.

Hemicyclum 2. *Frondosæ.*

Subtribus 1. Codonieæ, Dumortier.

22. *Fossombronia,* Raddi.

69. *F. pusilla,* L.; Hook. Br. Jung. t. 69 (sub *Jung.*); Syn. Hep. p. 468; H. P. 67.

Hab. Z_{0-1} in fossarum parietibus, haud vulgata. *St. Sever. Dax* (Grateloup). *B.-de-Bigorre.*

Subtribus 2. Haplolæneæ, N. ab E.

23. *Pellia,* Raddi.

70. *P. epiphylla,* L.; Hook. Br. Jung. t. 47 (sub *Jung.*); Syn. Hep. p. 488.

Hab. Z_{0-1} in fossarum marginibus.

71. *P. calycina,* Tayl. ! in Mackay, Fl. Hib. Pt. 2. p. 55 (sub *Jung.*); Syn. Hep. p. 490; H. P. 68.
Hab. Z_{0-1} P. occ. et c. in rivulorum ripis udis circa *Dax, Pau* et *B.-de-Bigorre.*

24. *Blasia,* Micheli.

72. *B. pusilla,* L. Sp. Pl. p. 1605; Syn. Hep. p. 491; H. P. 69. *Jg. Blasia,* Hook. Br. Jung. t. 82–84.
Hab. Z_{0-1} P. occ. in rupibus ophiticis *Sti. Pandelon* prope Aq. Tarbellicas. P. c. in humidiusculis montis *Superbagnères.*

Subtribus 3. Aneureæ, N. ab E.

25. *Aneura,* Dumortier.

73. *A. pinguis,* L. Sp. Pl. p. 1602 (sub *Jung.*); Syn. Hep. p. 493.
Hab. Z_0 "in paludibus ac ripis, fontibusque prope Aq. Tarbellicas" (Grateloup, *l. c.*).

74. *A. multifida,* L. Sp. Pl. p. 1602 (sub *Jung.*); Syn. Hep. p. 496.
Hab. Z_0 "ad terram humidam prope fontes ac supra truncos putridos arborum, circa *Dax*" (Grateloup, *l. c.*).

75. *A. palmata,* Hedw. Theor. Gen. (sub *Jung.*); Ekart, Synops. Jung. t. 13. f. 115; Syn. Hep. p. 498; H. P. 70.
Hab. Z_{0-3} in truncis putridis. *Val de Jéret,* &c.

Subtribus 4. Metzgerieæ, N. ab E.

26. *Metzgeria,* Raddi.

76. *M. furcata,* L.; Hook. Br. Jung. t. 55 et 56 (sub *Jung.*); Syn. Hep. p. 502; H. P. 71.
Hab. Z_{0-3} in saxis, arborum cortice, &c.

77. *M. pubescens,* Schrank; Hook. Br. Jung. t. 73 (sub *Jung.*); Syn. Hep. p. 504; H. P. 72.
Hab. Z_{0-3} in rupibus umbrosis montium frequens, planitiei rarior (*Dax*; Grateloup).

Tribus 2. Marchantieæ, N. ab E.

Subtribus 1. Lunularieæ, N. ab E.

27. *Lunularia,* Micheli.

78. *L. vulgaris,* Micheli, Nov. Gen. Pl. p. 4. t. 4; Syn. Hep. p. 511; H. P. 73.
Hab. $Z_{0-1\ inf.}$ in imis muris, viarum umbrosarum lateribus, &c. Pyrenæorum humiliorum ut et Agri Syrtici, frequens.

Subtribus 2. Jecorarieæ, N. ab E.

28. *Marchantia,* Linnæus.

79. *M. polymorpha,* L. Sp. Pl. p. 1603; Syn. Hep. p. 522.
Hab. Z_{0-1} locis exustis, &c., in planitie vulgatissime, in montibus rarius.

29. *Preissia,* N. ab E.

80. *P. commutata,* N. ab E. Europ. Leberm. 4. p. lxv. et 117; Syn. Hep. p. 539; H. P. 74. *Marchantia androgyna,* Tayl.! in Linn. Trans. 17. p. 380. t. 12. f. 1.
Hab. Z_2 in rupibus humidiusculis. *Mont Lizé*; *Labassère,* &c.

30. *Dumortiera,* Reinwardt.

81. *D. irrigua,* Wils. in Hook. Eng. Fl. v. P. 1. p. 106 (sub *Marchantia*); Syn. Hep. p. 543; H. P. 75. *Hygropyla irrigua,* Tayl.! in Linn. Trans. xvii. p. 390.
Hab. $Z_{1\ inf.}$ P. c. *B.-de-Bigorre,* ad ripas rivuli qui ad thermas dict. *de Salut* originem suam habet; sociis *Pellia calycina* et *Fegatella conica.*

31. *Fegatella,* Raddi.

82. *F. conica,* L. Sp. Pl. p. 1604 (sub *Marchantia*); Syn. Hep. p. 546; H. P. 76.
Hab. Z_{0-1} locis humidis.

32. *Reboulia,* N. ab E.

83. *R. hemisphærica,* Raddi in Opusc. scient. di Bolon. ii. p. 357; Syn. Hep. p. 548.
Hab. Z_0 *Dax,* in humidiusculis ac umbrosis (Grateloup; R. S.).

33. *Fimbriaria,* N. ab E.

84. *F. fragrans,* Schleich. Cent. exsicc. 3. n. 64 (sub *Marchantia*); Syn. Hep. p. 558.
Hab. Z_0 "ad margines fontium et fossarum ac in rupibus umbrosis prope *Dax*" (Grateloup, *l. c.*).

Subtribus 3. Targonieæ, N. ab E.

34. *Targionia,* Micheli.

85. *T. Michelii,* Corda in Opitz Beitr. i. p. 649; Syn. Hep. p. 574. *Targionia hypophylla,* L. Sp. Pl. p. 1604.
Hab. Z_0 "circa *Dax*" (Grateloup, *l. c.*).

Tribus 3. Anthoceroteæ, N. ab E.

35. *Anthoceros,* Micheli.

86. *A. lævis,* L. Sp. Pl. p. 1606; Syn. Hep. p. 586.
Hab. Z_0 "ad terram, in locis umbrosis humidiusculis, prope Aq. Tarb." (Grateloup, *l. c.*).

87. *A. punctatus,* L. Sp. Pl. p. 1601; Syn. Hep. p. 583; H. P. 77.

Hab. Z_{0-1} locis humidis solo argilloso præcipue. *St. Pandelon. St. Sever. Loucrup* prope *B.-de-Bigorre.*

Tribus 4. Ricciæ, Lindenberg.

36. *Sphærocarpus,* Micheli.

88. *S. Michelii,* Bell.; Mont. in Ann. des Sc. nat. ix. p. 39; Syn. Hep. p. 595.

Hab. Z_0 circa *Dax.* "Elle croît sur la terre humide de quelques landes de *Marensin,* par l'ancienne route de *Bordeaux* à *Bayonne*" (Grateloup, *l. c.*).

37. *Riccia,* Micheli.

89. *R. glauca,* L.; Syn. Hep. p. 599.

Hab. Z_0 "supra terram argillaceam in locis umbrosis *Dax*" (Grateloup, *l. c.*); locis cultis *Sti. Sever.*

90. *R. ciliata,* Hoffm.; Syn. Hep. p. 602.

Hab. Z_0 "ad terram madidam circa *Dax*" (Grateloup, *l. c.*).

91. *R. fluitans,* L.; Syn. Hep. p. 610.

Hab. Z_0 "in fontibus *Sti. Pandelon,* &c." (Grateloup, *l. c.*); *St. Sever* (Dufour!).

92. *R. natans,* L.; Syn. Hep. p. 606.

Hab. Z_0 "in aquis stagnantibus *Sti. Paul,* prope Aq. Tarbellicas" (Grateloup, *l. c.*).

XIII.—*Remarks on the Growth of* Bambusa arundinacea *in the large Conservatory, Chatsworth.* By Mr. Robert Scott*.

In the tropics the Bamboo not only grows with astonishing rapidity, but attains a very great height,—in some instances as much as 100 feet†. This, together with its feathery elegance, places it in bold contrast to surrounding vegetation, and entitles it to rank second to the noble Palm. But under artificial culture it is indeed seldom seen in anything like its native majesty,—the extent of our horticultural structures not admitting of its full development.

In some degree at least this defect is obviated here, the *Bambusa* being planted out in a border of rich loam, with plenty of room for its roots, and the canes likewise, in most cases, having ample accommodation. So situated the Bamboo seems at home.

* Read before the Botanical Society of Edinburgh, July 12, 1849.

† Mr. John Gibson, who collected in India for the Duke of Devonshire, has seen the Bamboo 100 feet high.